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ABSTRACT

This guide focuses on over-the-counter (OTC) stimulants sold to high school aged athletes and dieters as "herbal energizers," food supplements, and fatigue reducers. While advertising often makes them appear healthful and harmless, all of these stimulants belong in the class "sympathomimetic amines," so called because they mimic the sympathetic nervous system hormones. The paper discusses how these stimulants work, indicates which drugs are contained in various OTC stimulants, and lists adverse affects. Sports testing limits for amateur athletes are outlined, as well as advertising ploys to make OTC stimulants appealing, particularly to younger users. Concerns for teachers, parents, and youth coaches include: (1) teen athletes are particularly susceptible to persuasive marketing and claims as well as to overuse syndromes; (2) teenage girls are at the highest risk to anorexia and bulimia nervosa and overuse of diet aids; (3) terms like "herbal," "natural," and "no caffeine" are used to give a false sense of security; (4) there is a lack of control of over distribution, sale, and use of these products by minors; and (5) combination of symptoms and conditions associated with stimulants as well as the combined (synergistic) effects of OTC stimulants and caffeine can be fatal. Suggested actions include educating adults and teens on marketing ploys and on the effects and risks of using OTC stimulants. Also, concerned adults can request gyms and stores to place these dangerous stimulants out of reach of minors and to voluntarily agree to sell them only to adults. A list of resource organizations is included. (Contains 21 references.) (ND)

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Herbal Energizers: Speed By Any Other Name

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Introduction
Currently, there are over a hundred types of over-the-counter stimulants sold in US. The focus of this paper is on the stimulants sold to high school aged athletes and dieters. These over-the-counter stimulants (OTC-S) are sold as "herbal energizers," food supplements, and fatigue reducers. The advertising often makes them appear healthful and harmless. All of these stimulants belong in the class, *sympathomimetic amines*, a potentially dangerous and addictive class of drugs similar in structure and actions to amphetamines.

Main Effects of Sympathomimetic Amines
Sympathomimetic amines are a class of drugs that imitate the actions of the sympathetic nervous system (Knoben, & Anderson, 1988). The sympathetic nervous system stimulates the *fight or flight responses*. The fight or flight response readies the human for extreme muscle activity such as battling a foe or running for one's life. All non-battle activities or functions such as digestion and sexual function are shut down (see Table 1).

Table 1
Summary of Sympathetic Nervous System Arousal

Increases	Decreases
alertness	saliva production (cotton mouth)
anxiety	digestion
heart rate	sexual function
cardiac output	blood to internal organs
blood pressure	sleep & REM cycle
respiration rate	appetite
muscle tension	fatigue
perspiration	concentration
urination	
blood supply to skeletal muscles & brain	
dilation of pupils & bronchioles	
blood sugar production	

The fight or flight response is what teenagers call, "an adrenaline rush." Most of the responses are the result of the release of two hormones, epinephrine (adrenaline) and norepinephrine (nor-adrenaline) (Marieb, 1992). Drugs that directly stimulate the sympathetic nerves or receptors or cause the release of these excitatory hormones are termed *sympathomimetic* because they "mimic" the sympathetic nervous system hormones and its subsequent stimulatory actions (Hanson & Venturelli, 1995). Short term stimulation of the sympathetic nervous system is not harmful since it is usually resolved promptly and control of the body systems is returned to parasympathetic (relaxation) nervous system domination. Most side effects and risks of sympathomimetic amines are tied to abnormally high or chronic stimulation of the sympathetic nervous system.

The most common types of stimulants used in OTC-S's are caffeine, ephedrine, psuedoephedrine, and phenylpropanalomine. These drugs have legitimate use as anti-histamines, cold medications, and for asthma relief and are found in over-the-counter medicines such as Actifed, Allerest, Contac, Nyquil, and Drixol. The desired main effects are bronchial dilation, sinus drying, and drowsiness (Knoben & Anderson, 1988). The FDA requires that over-the-counter medications have clear instructions and warnings. Unfortunately, often these side effects appear even when these drugs are taken within the recommended doses (see Table 2). Reactions to all drugs vary from person to person.

Table 2
Common Over-The-Counter Sympathomimetic Amines

Drug	Cold Medicine/Anti-Histamine	Exercise /Diet Aid
Chlorprenaline	Asthone (Japanese)	
*Ephedrine (includes Ma Huang Chinese herbal ephedra)		High Energy Herbal Energy Formula, High Energy max. Strength, Diet Now: Sensible Diet & Wt. Management Plan, E'Ola Drops
Phenylephrine	Coricidin, Dristan, Neo-Synephrine	
Pseudoephedrine	Actifed, Afrinol, Sudafed, Drixol, Chlortrimeton	
*Phenylpropanolamine	Allerest, Contac, 4 Way Formula, Nyquil, Vicks Nighttime Cold Medicine	Acutrim, Dexatrim, Metabolift Thermogenic Formula, Permathin-16 Maximum Strength,
*Caffeine (xanthine with sympathetic actions)	Anacin, Exedrine, No-Doz,	Caffedrine

**Most common over-the-counter stimulants. Note: The sale of the combination of these three has been banned by the FDA.*

Adverse Effects of Over-the-Counter Stimulants
The onset and nature of side effects from OTC stimulants are dependent on individual drug reactions, dose, duration of use, and tolerance. All of these drugs can cause an increase in physical tolerance with repeated use, therefore, the individual will need to increase the dosage progressively in order to attain the desired results. With increased dosages comes an increased risk of side effects. Physical tolerance and prolonged use will also be followed by withdrawal syndrome upon cessation of use. Withdrawal symptoms can include depression, fatigue, irritability, nausea, and headache (Holtzman, 1990).

The most common main and side effects of OTC stimulant use include, but are not limited to, anxiety to agitation, alertness to disorientation, increased muscle tension and shakes, mildly elevated heart rate to tachycardia or dangerously elevated heart rate levels (Boyd, 1986). Appetite is suppressed although the large intestine and bowel may be stimulated. Urine production is increased as is blood glucose production. Temperature elevation can range from mild to severe hyperthermia (overheating) (Appelt, 1993, Heishman & Hennigton, 1992).

Ephedrine is particularly dangerous and the FDA is currently examining tightening of regulations controlling its sale and distribution following twelve reported deaths due to ephedrine overdose(Substance Abuse Funding News, 1995). Ephedrine can cause heart palpitations, hypertension, nerve damage, muscle injury, psychosis, stroke and death. Ohio has passed laws restricting all sales of ephedra and ephedrine following the overdose death of a high school athlete (Consumer Reports, 1995). There is also strong concern over the use of ephedrine in the manufacture of illegal forms of methamphetamine known as "crank" and "crystal meth" (Kleiner, 1994). Currently, the FDA prohibits the sale of ephedrine in large quantities but nothing prohibits drug chemists from purchasing multiple quantities of over-the-counter ephedrine from multiple distributors.

Pseudoephedrine, is nearly identical in structure and effects to ephedrine and is also derived from plant sources of the genus, Ephedra (McEvoy, 1990). Like ephedrine, it may be sold as a "natural" herbal stimulant and manufacturers may tout it's ergogenic or sports enhancing effects, none of which are supported by research (Clemons, & Crosby, 1993

Collins, 1993). The main effects, side effects, and risks are essentially the same between the ephedrine and psuedoephedrine and both drugs are on the banned lists for most athletic unions.

A false sense of security may surround the use of over-the-counter stimulants but these drugs are only safe when used as recommended and in the doses recommended. The uninformed user of these drugs may accidentally overdose as the result of the combined or synergistic effects of multiple drug use. The deadly triple combination of ephedrine, caffeine, and phenylpropanalomine has been banned by the FDA since 1982. The potential still exists, however, for an individual to combine phenylpropanalomine and ephedrine, wash them down with a cup or two of coffee or a double latte and end up in a critical overdose situation!

Phenylpropanalomine by itself can cause nervousness, restlessness, insomnia, headache, nausea, elevated blood sugar, and elevated blood pressure. The Public Citizen Health Research Group (1991) has reported that some research indicates that at least twenty percent of people using the drug have severe reactions to phenylpropanalomine.

Most research indicates that low doses of caffeine in the 100-300 mgs/day (1 to 3 cups/day) range do not likely cause any serious side effects of health detriments (Heishman & Hennigton, 1992). However, it should be noted that individual reaction to any drug varies. Hypercaffeinism results from high or prolonged doses of caffeine. Doses in excess of 300 mgs/day may produce elevated heart rate, blood pressure, diarrhea, gastric upset, insomnia REM deprived sleep, anxiety, tension, nervousness, muscle twitches. Extremely high doses in excess of 500 mgs/day (over five cups/day) can result in psychotic disorders, convulsions, muscle spasms, extreme anxiety, paranoia, respiratory collapse, heart palpitations, even death (Heishman & Hennigton, 1992, Wisconsin Clearinghouse, 1986).

Caffeine is an addictive substance and tolerance is developed over time. Increased tolerance causes a need for progressively larger doses over time. Acute withdrawal will set in within 24 hours of cessation of use resulting in headache, fatigue and lethargy, decreased alertness, and nervousness, flu-like symptoms, muscle pain, and nausea. Most withdrawal symptoms pass within seven days of cessation of caffeine use (Holtzman, 1990).

Those caffeine side effects of greatest concern for high school coaches and school medical personnel are: inability to concentrate, anxiety, tachycardia (high heart rate), dehydration from increased urine output, and loss of muscle coordination (Knoben & Anderson, 1988). Although caffeine has been found to increase the availability of certain fatty acids under aerobic conditions (McNaughton, 1987), the possible performance enhancing effects of caffeine and other OTC stimulants are usually negated by the side effects (Casal & Leon, 1985, Rogers, 1985).

Regardless of the cause, whether it is drug or stress induced, prolonged stimulation of the fight or flight response results in chronic stress syndrome. Chronic fatigue, anxiety, adrenal depletion, and even paranoid delusions and psychosis may result (see Table 3).

Table 3
Summary of Risks to Stimulant Abuse

Acute psychiatric disorders
Addiction/dependence
Anxiety disorders
Cardiac disorders and arrhythmias
Chronic fatigue syndrome
Chronic stress syndrome
Dehydration
Depression
Disqualification from athletic event
Heart failure
Hyperthermia (high body temperature)
Hypertension (high blood pressure)
Nervousness
Muscle spasms and injury
Respiratory collapse
Stroke
Shakes and tremors
Tolerance
Withdrawal syndrome

Stimulants and Sport Drug Testing Limits
Most drug testing programs for amateur athletics are modeled after the International and US Olympic Committees (IOC and USOC) drug testing programs. The lists of banned substances such as anabolic steroids, amphetamines, and other stimulants are comparable, if not identical, in most cases.

All of the common stimulants found in over-the-counter medications and herbal energizers are listed as banned substances by the International and US Olympic Committees (USOC) and the National Collegiate Athletic Association (USOC 1988, Benson, 1991). These stimulants include, but are not limited to, ephedrine in both natural and synthesized form, psuedoephedrine, phenylpropanolamine, and caffeine.

The US Olympic Committee (1988) caffeine limit is any concentration greater than 12 mcg/ml in the urine, this would be equal to six to eight cups of drip brew coffee in a two hour period, however, it is entirely possible for an athlete to use several stimulants and drink a variety of beverages and reach this limit unknowingly. Two cups of coffee would result in 3 -6 mcg./ml, two colas would produce .59 - .70 mcg./ml, one No-Doz, 1.5 mcg./ml. in the urine Suprisingly, only one cup of guarana tea, which contains as high as six percent caffeine, could cause an unacceptable level of caffeine in an athlete's urine (Merdink & Wooley, 1990).

It is suggested that before taking any over-the-counter of prescription anti-histamine, asthma medication including mists, cold medicine or stimulant, the athletic union and/or your team physician be contacted. The US Olympic Committee reports that OTC cold medications and anti-histamines can be detected up to 72 hours after last use (USOC, 1988).

Advertising Ploys
Advertisers of food supplements, some of which contain stimulants, target young weightlifters, bodybuilders, and athletes by using words and phrases which remind the reader of anabolic steroids such as "*..has twice the anabolic effect.*" They use terms like "herbal," "natural," and "nutrition supplement" to give the impression that these are healthful and harmless substances.

The advertisers balance these safe and gentle words and phrases with powerful hyperbole meant to appeal to the sports minded, hard working young athlete: "T & M Delivers!," "Performance-Enhancing," "high intensity," "explode," and "break through." "Kickers" are ephedra tablets packaged in a bright orange and silver envelope with a karate champion on the front to emphasize the power of the drug and to make the sports link. These sell for a dollar a piece at mini-markets and are one of the most popular OTC stimulants on the market.

Some of the advertising campaigns are fully confrontational and appeal to an athlete's risk taking tendencies and sense of pride. One advertisement, aimed at young bodybuilders, even states outright, this product *is "Not for every Pencil-Necked Ding Dong in your gym"* and then challenges the athlete, "*If you're sick and tired of taking mamby pamby-feel nothing-do little supplements...then Ultimate Orange is for you.*"

Diet aids aimed at women and girls are now being sold out of home business. Signs are appearing on lawns and telephone poles which call their product, *"Will Power in a Bottle*" and claim "*Lose up to 30 lbs. In 30 days...without exercising!* ," "*Great for men's spare tire*, " and "*Lose weight and inches.*" Most of these products contain ephedrine and caffeine. Most of the home dealers of these stimulants have no medical training and little or no knowledge of the effects of sympathomimetics.

What's in a name?
Packaging and advertising of diet products aimed at young women and dieters are no less suggestive than those aimed at athletes. Names like "Dexatrim," "Diet Now," "Mini-Thin," and "Permathin" give the clear impression that the drug is going to contribute to significant weight loss and "thinness."

For the student studying late or the drowsy driver there are products sold over-the-counter at truck stops and mini-marts called "Super Ener-Max," Super Pep Extra Strength," and "Mega-Blast," "Ultra Energy Now," and simply, "UP-Time." The OTC stimulants are often shaped to resemble more powerful and dangerous amphetamines. Mini-Thins are white with a fine cross on the top to imitate the prescription stimulant, Benzedrine (see Table 4).

Table 4
Common OTC Stimulants
(often sold at mini-marts and gas stations)

Brand Name	Drug	Dose
Kickers Chinese Herbs	Ma Huang (Chinese ephedrine)	Not revealed
Ultra Energy Now	Ma Huang (Chinese ephedrine) Guarana Extract (caffeine) Kola (caffeine)	Not revealed " "
Mini-Thin	Ephedrine HCL (stimulant, anti-histamine)	25 mgs
Gin Zing	Ma Huang (Chinese ephedrine) Guarana (caffeine)	1000 mgs. 500 mgs
Mega BLAST High Energy formula	Ma Huang (Chinese ephedrine) Gota Kola (caffeine) Caffeine	450 mgs 225 mgs 150 mgs
Super PEP Extra Strength	Kola Nut (caffeine) Guarana (caffeine) Gota Kola (caffeine)	Not revealed " "
Super Ener-Max	Ma Huang (Chinese ephedrine) Green Tea Extract (caffeine) Kola Nut Extract (caffeine)	220 mgs. 100 mgs. 80 mgs.
UP Time Food Supplement	Caffeine	Not revealed

Common "Herbal" Stimulants
The following is a list of the most common herbal stimulants sold in over-the -counter herbal energizers and food supplements:

Ma Huang (ephedra) contains the drug, *ephedrine*, in it's natural form. There is no pharmacological difference in the natural or synthesized form of the drug--the effects are the same on the human body.

Guarana (paullnia cupana) is a bean much like the coffee bean, however, it contains much more caffeine. Caffeine content in the guarana bean is between 2 and 6 percent.

Green Tea (camellia sinensis) contains between 3 and 4 percent caffeine.

Coffee (coffea arabica) is a bean and contains between 0.8 and 2.4 percent. The average cup of drip coffee contains 110 to 150 mgs of caffeine.

Kola nut contains only a minuscule amount of caffeine. Most of the 33 to 60 mgs of caffeine found in cola soft drinks is added in it's synthetic form.

Cocoa (theobroma cacao) contains small amounts of caffeine which is present in chocolate candy and coca drinks. Chocolate bars contain approximately 22 mgs. Of caffeine whereas hot cocoa contains around 5 mgs. of caffeine.

Concerns for Teachers, Parents and Youth Coaches
1) Teen athletes are particularly susceptible to persuasive marketing and claims
2) Teenage girls are at the highest risk to anorexia and bulimia nervosa and overuse of diet aids

3) Teens are susceptable to overuse syndromes e.g., If one works, ten will work ten times better.
4) Terms like "herbal," "natural" and "no caffeine" are used to give a false sense of security.
5) There exists lack of control over distribution, sale, and use of these products by minors.
6) The combination of symptoms and conditions associated with OTC stimulants use may become fatal. Example: Athletes or dieters who are dehydrated may suffer cardiac arrest from the combined effects of low blood volume and high heart rate.
7) The combined (synergistic) effects of OTC stimulants and caffeine can be fatal. Example: The deadly combination of ephedrine, caffeine, and phenylpropanalomine has been banned by the FDA since 1982.
8) The failure of athletic drug tests and subsequent penalties negates the use of OTC stimulants.

What Can be Done?
Parents, coaches, and teachers can take action in two ways: First, they should educate themselves and then educate teens on the marketing ploys, the main and side effects, and the risks of over-the-counter stimulants. The American Council for Drug Education and the National Federation of Parents for Drug-Free Youth can be contacted for information and teaching resources. Many states have coalitions such as The Wisconsin Clearinghouse for Drug Information and the Washington State Substance Abuse Coalition that readily provide information, education, and referrals for teachers, parents and coaches working with and educating youth.

Secondly, concerned adults can request gyms, stores and mini-markets to place these dangerous stimulants out of reach of minors and to voluntarily agree to only sell them to adults. Most stores are acting within the limits of the current laws which permit them to sell any OTC medication to minors or adults. Many business owners, however, are unaware themselves of the potential dangers of OTC stimulants and are resceptive to community concerns. Organized citizen groups can appeal to city councils who can pass ordinances restricting or prohibiting businesses from selling OTC stimulants to minors. The state pharmaceutical board can also be contacted and they can ask vendors for voluntary compliance with restricted sale of OTC stimulants to minors.

Resources
American Council for Drug Education (301) 294-0600
National Clearinghouse for Alcohol & Drug Information,
PO BOX 2345, Rockville MD 20852
National Federation of Parents for Drug-Free Youth: 800-554-KIDS
National Institute on Drug Abuse 800-662-HELP
National Institute on Drug Abuse, US Dept. Of Health and Human Services 800-638-2045
Parents Resource Institute for Drug Education (404) 577-4500
PRIDE Drug Information Line 800-241-9746
Wisconsin Clearinghouse (608) 263-2797
Washington State Substance Abuse Coalition 800-662-9111
Washington State Pharmacists Association (206) 228-7171
Washington State Board of Pharmacies (206) 753-6834
Schools Without Drugs: The Challenge (202) 732-4161

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